US009843149B1

(12) **United States Patent**
Irbe et al.

(10) **Patent No.: US 9,843,149 B1**
(45) **Date of Patent: Dec. 12, 2017**

(54) **FOLDABLE POWER STRIP**

(71) Applicant: **COLEMAN CABLE, LLC**, Waukegan, IL (US)

(72) Inventors: **Trisha Irbe**, Pleasant Prairie, WI (US); **Daniel Sabato**, Gurnee, IL (US); **Shiao-Tsun Ku**, Fishers, IN (US)

(73) Assignee: **COLEMAN CABLE, LLC**, Waukegan, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/268,103**

(22) Filed: **Sep. 16, 2016**

(51) **Int. Cl.**

H01R 25/00	(2006.01)
H01R 27/02	(2006.01)
H01R 31/00	(2006.01)
H01R 33/00	(2006.01)

(52) **U.S. Cl.**
CPC ***H01R 25/003*** (2013.01)

(58) **Field of Classification Search**
CPC H01R 13/645; H01R 35/04; H01R 39/64; H01R 39/00; H01R 39/28
USPC 439/640, 652
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,959,021	A	9/1990	Byrne	
6,220,889	B1	4/2001	Ely et al.	
6,786,734	B2	9/2004	Yu	
7,112,097	B1	9/2006	Lam	
7,374,425	B1	5/2008	Kuo et al.	
7,488,204	B2 *	2/2009	Hsu	H01R 25/003 439/106
D597,948	S *	8/2009	Bizzell	D13/139.1
7,625,241	B2 *	12/2009	Axland	H01R 25/006 439/640
7,808,761	B2	10/2010	O'Rourke	
8,157,574	B2 *	4/2012	Hsiao	H01R 13/4532 439/131
8,262,399	B1 *	9/2012	Zien	H01R 25/003 439/188
9,147,985	B1	9/2015	Noriega	
9,484,692	B2 *	11/2016	Irons	H05K 7/1492
9,525,252	B2 *	12/2016	Kim	H01R 25/003

(Continued)

FOREIGN PATENT DOCUMENTS

DE	20313536	U1	12/2003
EP	2228872	A1	9/2010
JP	2005071850	A	3/2005

OTHER PUBLICATIONS

English Machine Translation of German Publication No. DE20313536 (Ahoku Electronic Company), Published Dec. 18, 2003.

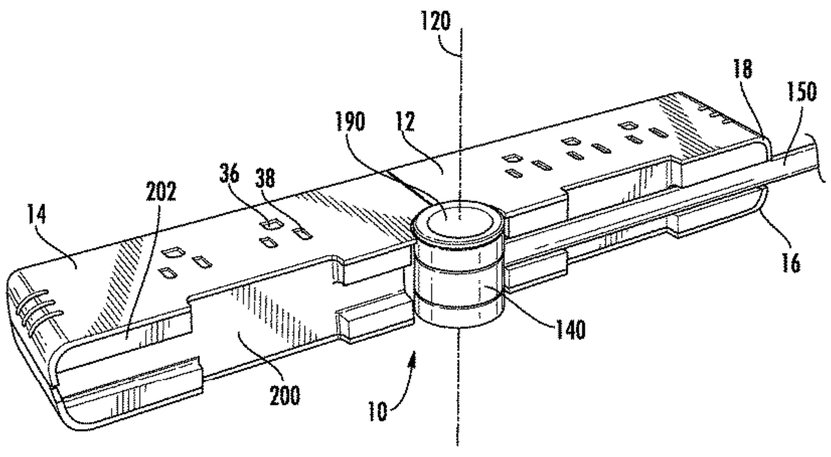
(Continued)

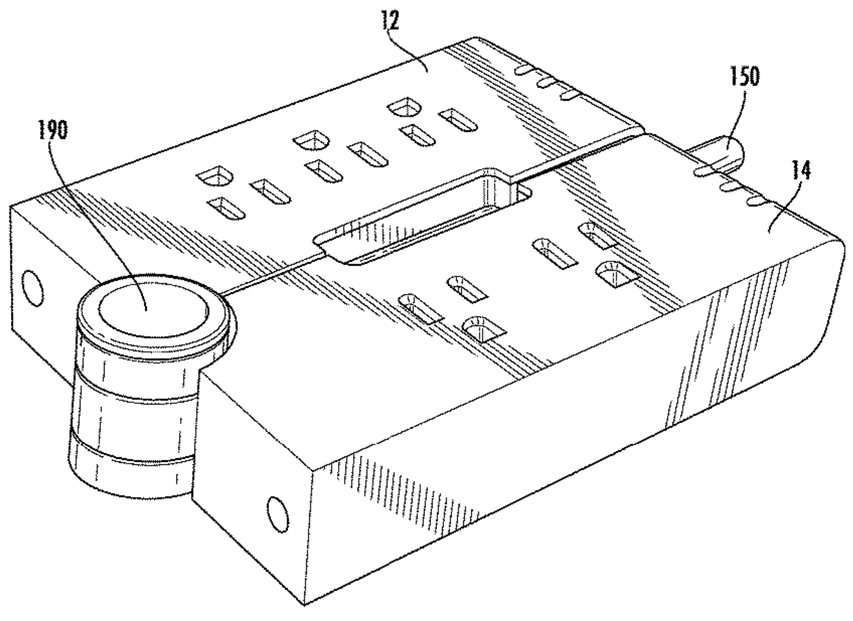
Primary Examiner — Abdullah Riyami
Assistant Examiner — Thang Nguyen
(74) *Attorney, Agent, or Firm* — Patzik, Frank & Samotny Ltd.

(57) **ABSTRACT**

A foldable power strip having a pair of housing members having one or more outlets thereon and being rotationally connected together about a hinge or vertical axis. A power cord housing is also connected about the hinge or vertical axis to permit the housing members and power cord to be independently rotated relative to one another. The inside walls of the housing members may include side members that define a recess for receiving and protecting the power cord when the housing members are in the closed position.

14 Claims, 6 Drawing Sheets





(56) **References Cited**

U.S. PATENT DOCUMENTS

2012/0028505	A1	2/2012	Weber et al.	
2012/0108101	A1*	5/2012	Hu	H01R 24/22 439/527
2012/0282805	A1	11/2012	Ku et al.	
2013/0102174	A1*	4/2013	Brown	H01R 35/04 439/218
2013/0337662	A1	12/2013	Lopez et al.	
2014/0102870	A1	4/2014	Zien et al.	
2014/0144670	A1*	5/2014	Irons	H01R 13/5841 174/86
2014/0187079	A1*	7/2014	Zien	H01R 13/514 439/490

OTHER PUBLICATIONS

English Machine Translation of Japanese Publication No. JP2005071850 (Kawasaki Electric Wire), Published Mar. 17, 2005.

* cited by examiner

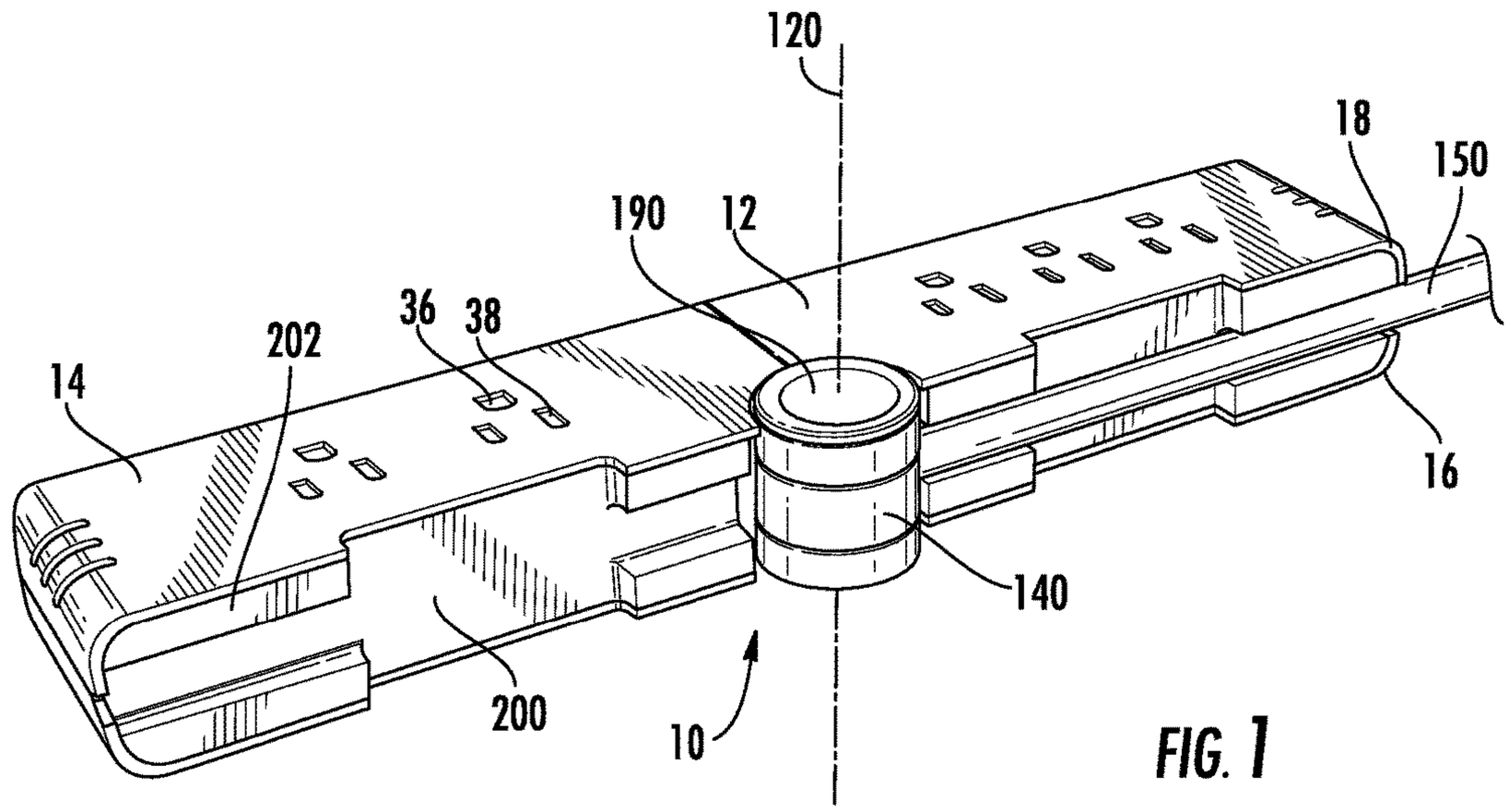

120
18
150
190
12
36
38
202
14
16
140
200
10

FIG. 1

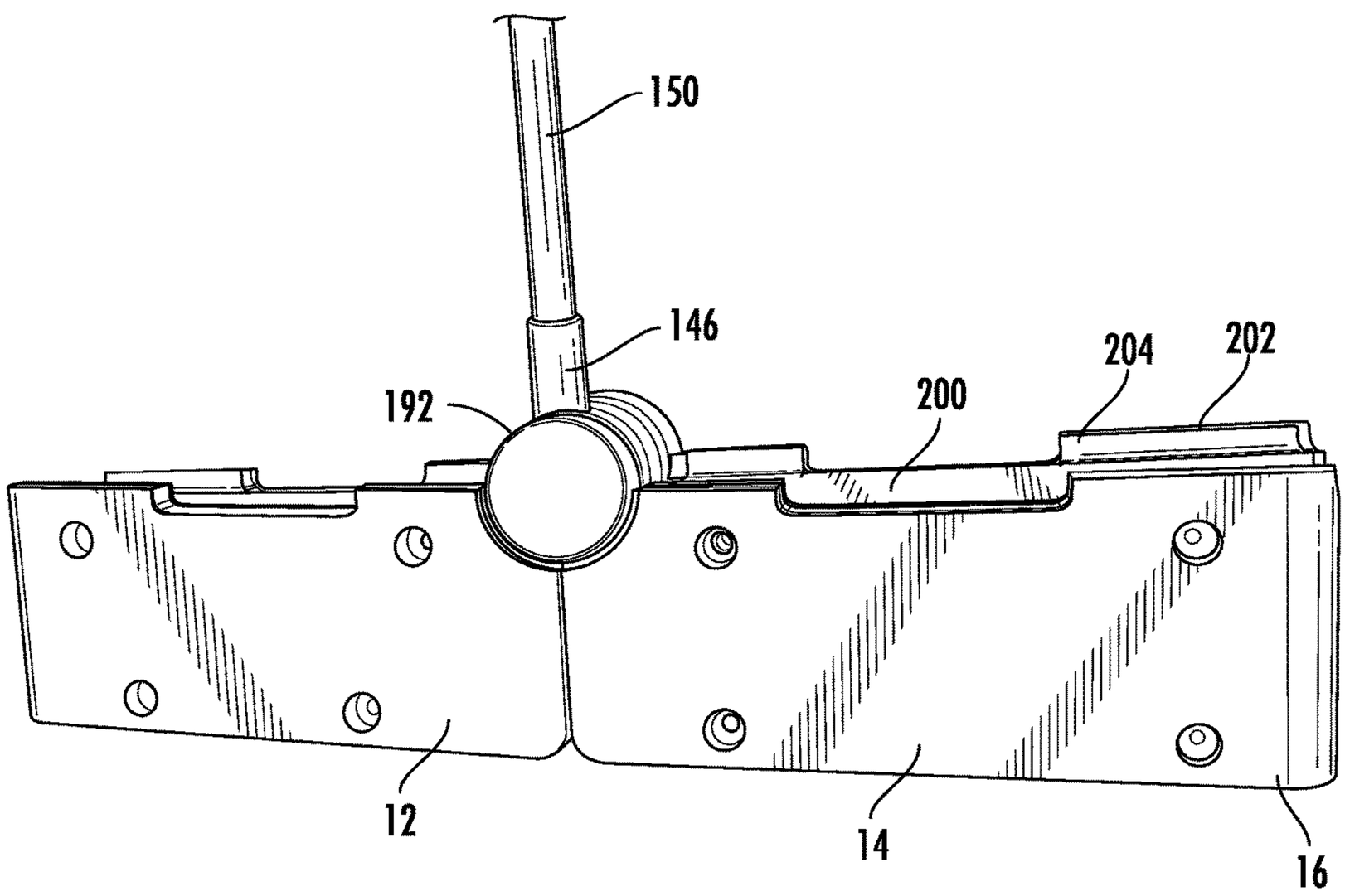

150
146
192
200
204
202
12
14
16

FIG. 2

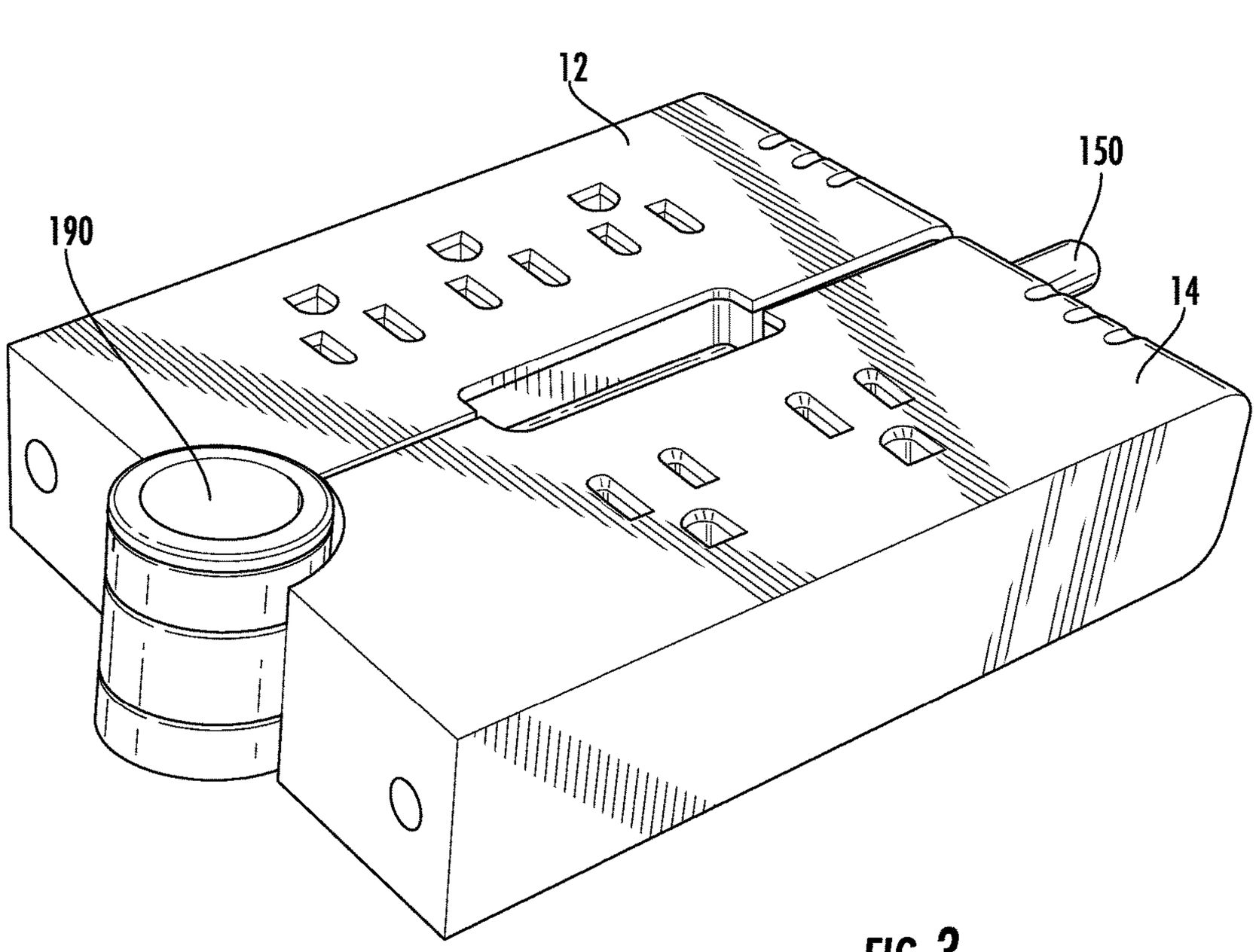


FIG. 3

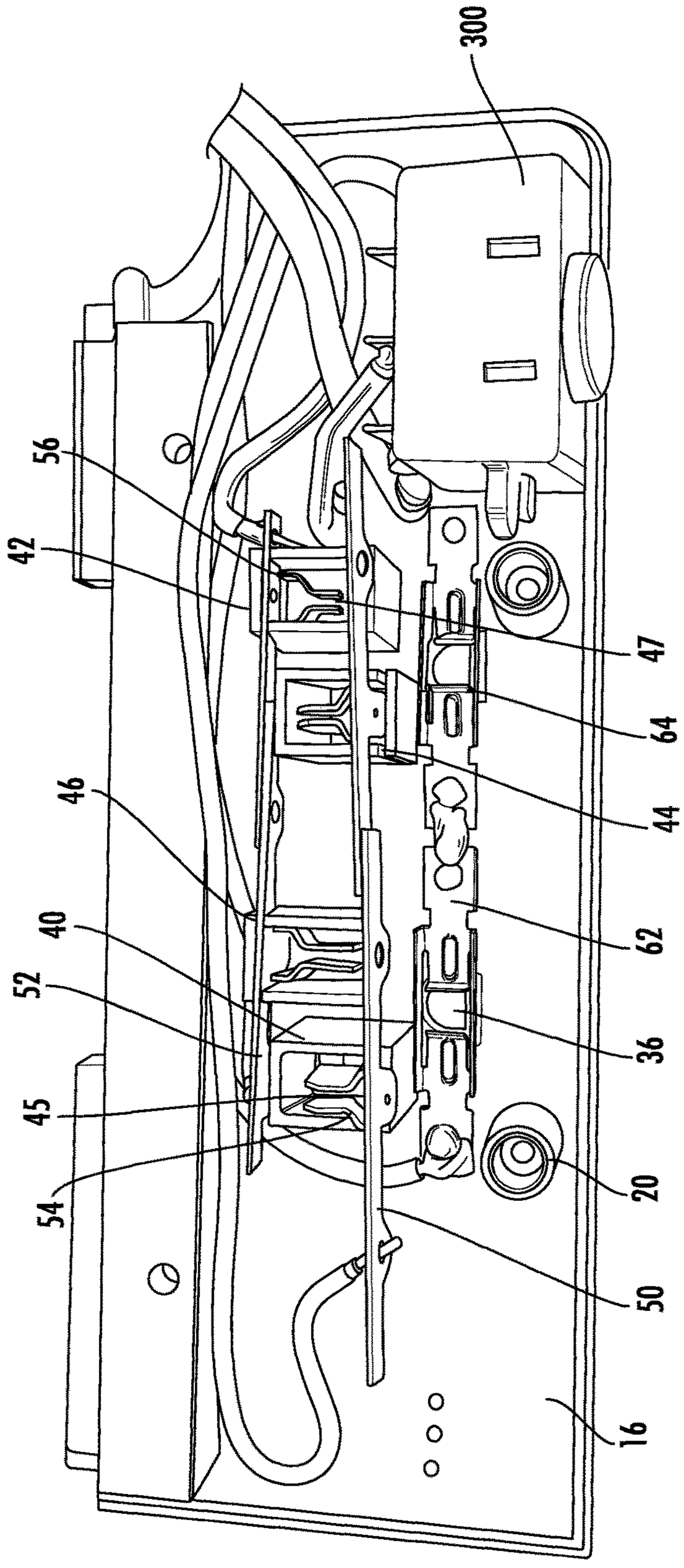


FIG. 4

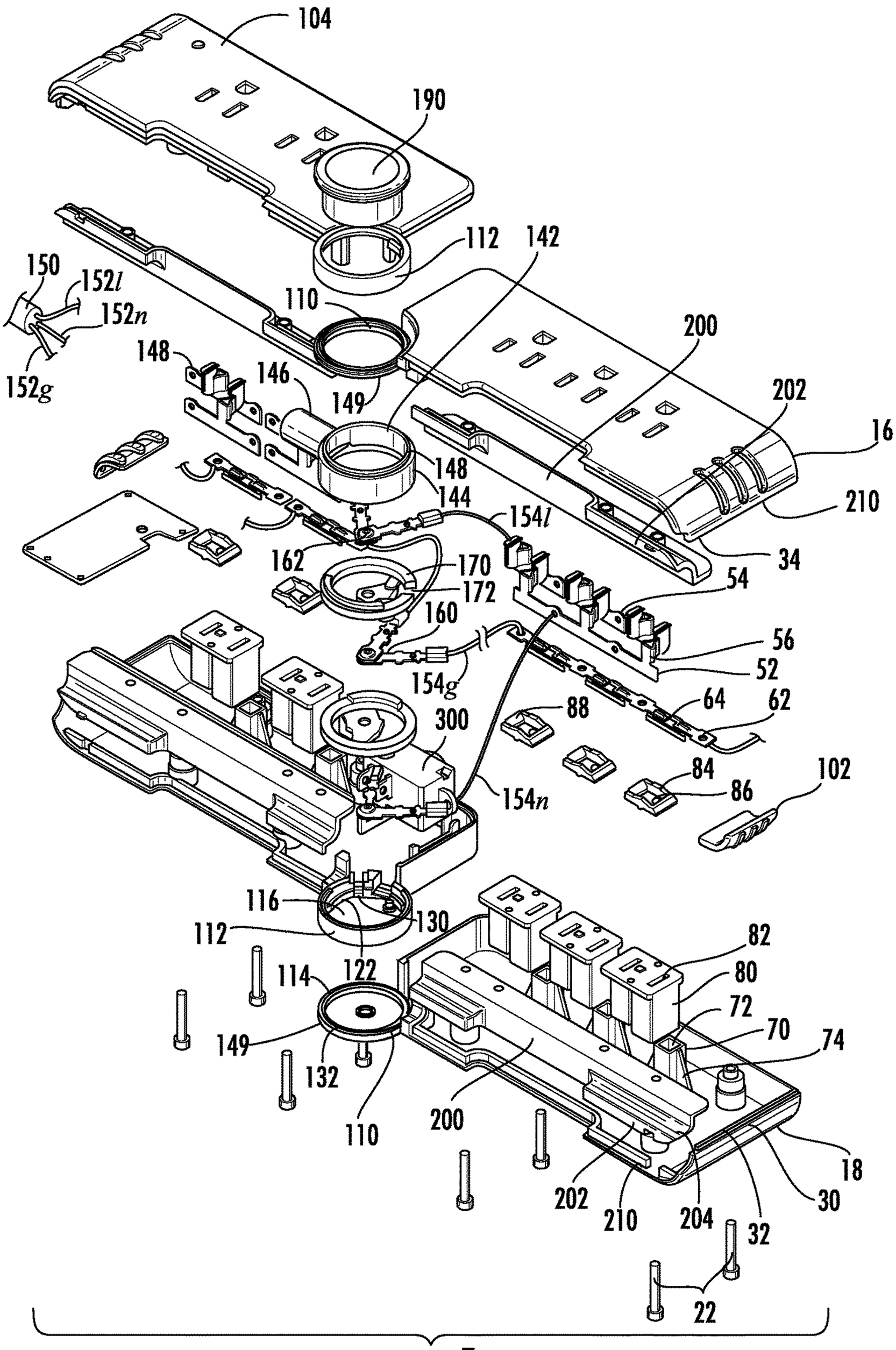

104
190
112
142
150
152l
152n
152g
110
200
148
146
149
202
16
148
144
210
154l
34
162
170
172
54
160
56
52
154g
64
62
88
300
84
102
86
154n
116
130
112
82
114
122
80
72
70
74
149
132
110
200
18
202
210
204
30
32
22

FIG. 5

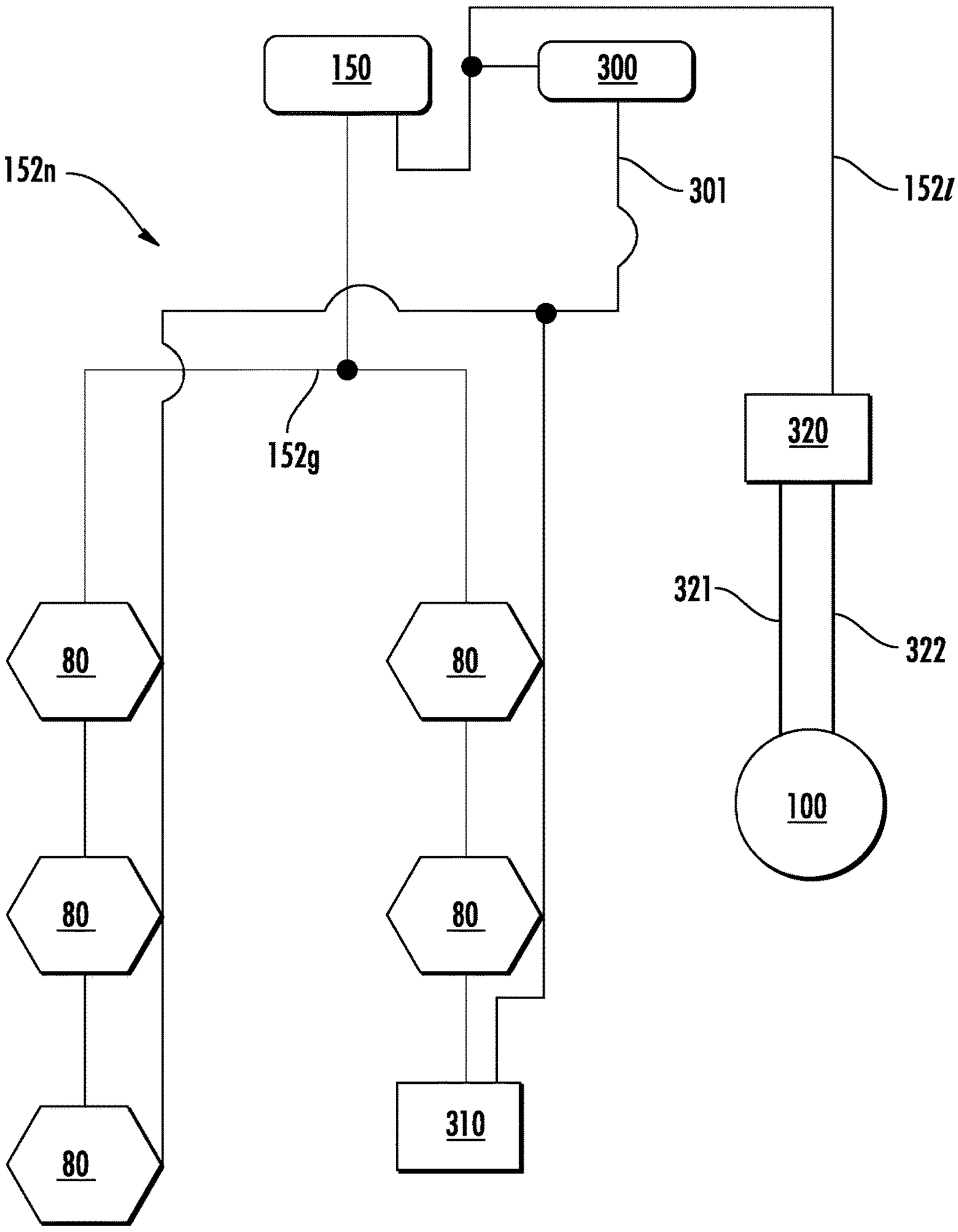


FIG. 6

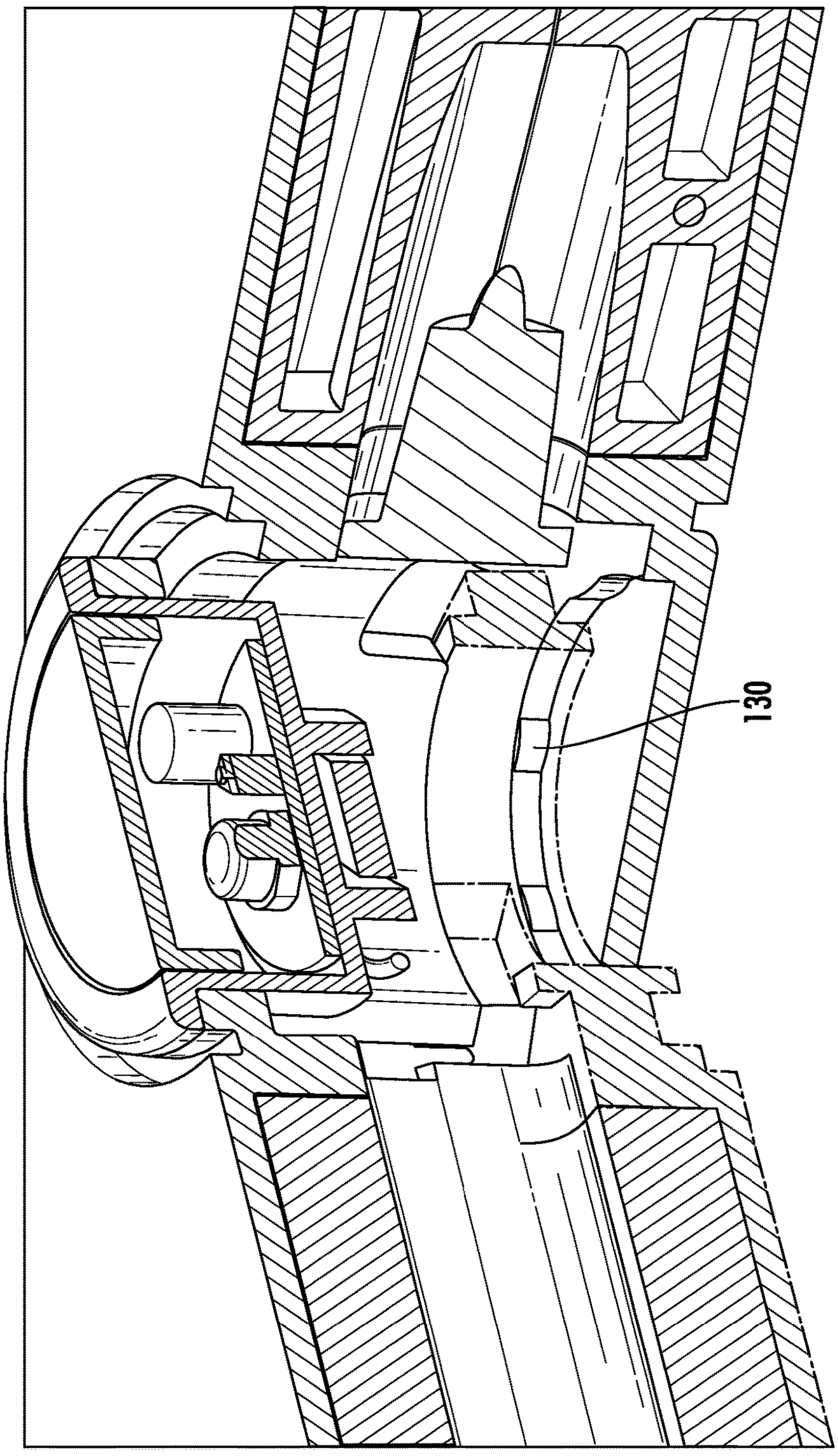


FIG. 7

FOLDABLE POWER STRIP

FIELD OF THE INVENTION

This invention relates generally to power strips and still more particularly to foldable power strips.

BACKGROUND OF THE INVENTION

Power strips are prevalently used to provide power to a number of different electrical devices attached thereto. Because of the different locations and applications where such power strips may be used, it has been known to have power strips of varying sizes and shapes. However, these devices have fixed power cords and do not permit adjustment of the power strip and cord into different positions relative to one another. This leads to a consumer having to purchase multiple power strips or be inconvenienced by the size or shape of the power strip and the location of the cord extending outward therefrom.

BRIEF SUMMARY OF THE INVENTION

The present invention comprises a foldable power strip having components that move relative to one another about a hinge or axis to allow positioning of the power strip and cord in a number of different configurations to adjust to the environment of where the power strip is used. The power strip comprises a pair of housing members hingedly connected together for rotation between an elongated open position and a folded, closed position, with the ability to be positioned at a number of positions between the open and closed positions. The power strip includes an annular ring that receives a power cord and is positioned within a hinge coupling two power strip housing members, to permit the power strip members and power cord to each be independently rotated relative to one another. The housing members may also include side members on their inside walls that include arcuate sections that together define a recess or groove for receiving the power cord therein to protect it when the power strip housing members are in the closed position.

Accordingly, it is an object of the present invention to provide a foldable power strip that is economical and easy to manufacture and use.

Yet another object of the present invention is to protect the power cord connection to the power strip when in the closed position.

Still another object of the present invention is to provide a power strip that is adjustable into a number of different positions for use in a variety of different locations.

A further object of the present invention is to provide a foldable power strip that allows for the power cord to be independently rotated relative to the power strip members.

Other objects, features and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of one embodiment of the foldable power strip of the present invention in the open or extended position, with the power cord extending laterally along the power strip housing.

FIG. **2** is a perspective view of the foldable power strip of FIG. **1** with the power cord extending generally perpendicularly to the power strip housing.

FIG. **3** is a perspective view of the foldable power strip of FIG. **1** in the closed position.

FIG. **4** is a perspective view of one embodiment of the internal structure for the housing members of FIG. **1**.

FIG. **5** is an exploded perspective view of the foldable power strip of FIG. **1** showing a second embodiment of the internal structure for the housing members.

FIG. **6** is a schematic diagram of the foldable power strip of FIG. **1**.

FIG. **7** is a partial sectional view of the hinge of the foldable power strip of FIG. **1**.

DETAILED DESCRIPTION OF THE INVENTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail several specific embodiments, with the understanding that the present disclosure is to be considered merely an exemplification of the principles of the invention and the application is limited only to the appended claims.

FIGS. **1** and **2** show one embodiment of the foldable power strip **10** of the present invention having a first housing member **12**, a second housing member **14** and a power cord assembly **140** separately pivotable relative to one another about a vertical axis **120**.

Each of the housing members **12**, **14** includes a lower portion **16** and an upper portion **18** that may be attached to one another to form the housing. The lower and upper portions may be made out of a variety of materials including, but not limited to, Acrylonitrile Butadiene Styrene ("ABS"). Referring to FIGS. **4** and **5**, the lower portions **16** and upper portions **18** may include a plurality of corresponding threaded members **20** for receiving screws **22** through the lower portions **16** to permit the lower portions **16** and upper portions **18** to be attached to one another. In order to assist with the alignment of the lower portions **16** and upper portions **18**, the threaded members **20** on the lower portions **16** and upper portions **18** may include a tapered or smaller upper section **24** that can fit within the corresponding upper sections of the opposing threaded member **20**. In addition, the upper edge **30** of the lower portions **16** and upper portions **18** may include raised or offset walls or ridges **32** for fitting within corresponding walls or ridges **34** of the opposing lower portions **16** and upper portions **18**.

The upper portions **18** include a series of slots **38** and holes **36** for receiving one or more female plugs for electrical devices or appliances. While the power strip shown in the drawings is capable of receiving five 3-prong plugs (three on the first housing member and two on the second housing member), it is appreciated that the power strip may accommodate a different number of and/or types of plugs and not depart from the scope of the present invention.

FIG. **4** shows one embodiment of the internal components for housing the live, neutral and ground bus bars and terminals. The lower portions **16** of the housing members **12**, **14** include a series of internal walls **40** defining a plurality of rectangular containers **42**, with adjacent containers **42** being located proximate to and slightly offset from one another. Openings **44**, **46** at the opposite ends of the adjacent containers **42** define channels for receiving the live hot terminal bus bar **50** and the neutral bus bar **52**. The channels are preferably sized such that the bus bars may be press fit

and retained therein during use. Connected to each of the live and neutral bus bars **50**, **52** are terminals **54**, **56** that are sized to fit within the respective containers **42** and which define slots **45**, **47** for receiving the elongated narrow plugs of the three prong plug. Ground terminals **64** and bus bars **62** may be positioned within the upper housing portions **18** so that the ground terminals **64** in the bus bar **62** are aligned with the respective holes **36** of the outlet for the ground prongs of the plugs. The bus bars and terminals are made from a conductive material, including but not limited to, copper or other metals.

Referring now to FIG. **5**, another embodiment of the internal structure of the housing members is illustrated. The lower portions **16** include a series of raised members **70** that define cavities **72** that are positioned to align with the ground outlet opening **36** of the upper housing portion **18** and the ground terminals **64** when the housing members **12**, **14** are connected together. In particular, the ground bus bar **62** rests on top of or over the raised members **70** such that the outlet ground opening **36** is aligned with the ground terminal **64** and the cavity **72** to allow the ground prong of the plug to be inserted therein. The sides of the raised member may include flat vertical flanges **74** extending upward that, together with other raised members **70** on the lower housing portions **16**, guide placement of the internal sockets **80** in the power strip housing members for the neutral and live blades of the plug. Each of the interiors of the sockets **80** is sized to receive one of the live terminals **54** and neutral terminals **56** such that the slots **45**, **47** defined by the terminals **54**, **56** are aligned with the slots or openings **82** of the sockets **80**.

In order to help protect against children sticking objects within the sockets, the sockets may be tamper resistant. For example, referring to FIG. **5**, the sockets **80** may include rectangular covers **84** that are normally positioned such that at least parts of the covers **84** extend over the openings **82** of the sockets **80**. The covers **84** include an opening **86** therein with an angled wall **88** to allow a user to use the prongs of the plug to engage each cover **80** and slide it to reveal the openings **82** in the respective socket **80**, thereby allowing the plug to be inserted therein.

The power strip **10** may include a buzzer **100** such as a piezo electric buzzer that can provide an auditory warning for unsafe conditions such as, but not limited to, the power strip **10** not being properly grounded. If a buzzer **100** is utilized, a speaker cover **102** may be used to allow the buzzer **100** to be readily heard outside the power strip **10**. In one embodiment, the speaker for the buzzer may produce audible sound in the range of 68-74 decibels. The power strip **10** may also include one or more lights **104** visible from the outside of the power strip housing members **12**, **14** to provide information on the status of the power strip **10** and the sockets or outlets **80**. For example, 3-5 mm green light emitting diodes ("LEDs") may be used to indicate that power is flowing to a particular outlet, while 3-5 mm red LEDs may be used to warn of potential dangers.

The lower portions **16** and upper portions **18** of the first and second housing members **12**, **14** includes circular connectors **110**, **112** about adjacent corners to allow the housing members **12**, **14** to be rotationally moved relative to one another about a hinge or vertical axis **120**. In one embodiment, the circular connector **110**, **112** of one of the lower portions **16** and upper portions **18** may include a raised wall **114** that is sized to fit in the opening **116** defined by the other of the circular connector **110**, **112** to allow the connectors to be attached to one another. A series of circumferentially spaced-apart nodes **130** or other raised surfaces may be located on one of the outer side of the raised inner wall **114** and the respective inner wall **122** of the other of the circular connectors **110**, **112** that may engage detents, slots or other openings or members **132** on the other of the circular connector **110**, **112** to permit the housing members **12**, **14** to be selectively rotated through and maintained in a series of specific angular positions (e.g., every 12.5 degrees between 0 and 180 degrees).

Referring to FIGS. **1** and **5**, the power cord assembly **140** includes a power cord housing **142** and a power cord **150**. The power cord housing **142**, which may be made out of a variety of materials including but not limited to polyvinyl chloride ("PVC"), comprises an annular ring **144** and a tubular connector **146** extending therefrom to allow the power cord **150** to be rotationally connected to the housing members **12**, **14**. In the embodiment shown in the drawings, the annular ring **144** is sized to mate with or connect to the respective circular connectors **110**, **112** from the housing members **12**,**14** to allow the power cord **150** and housing members **12**, **14** to rotate independently from one another. The connectors **110**, **112** and ring **144** may include annular flanges or walls **148**, **149** on their tops and/or bottoms that are designed to allow the flanges **148** on the ring **144** to be nested within or on the outside of corresponding flanges **149** on the connectors **110**, **112**. The power cord **150**, which can be a 14/3 power cord with a polyvinyl chloride ("PVC") outer cover is inserted into the tubular connector **146**. The wires **1521**, **152***n*, **152***g*, namely the live, neutral and ground wires, extend through the center of the annular ring **144** and are connected to separate connector terminals **160** through screws **162** or other known means. Insulating rings **170** or other members are located between the respective connector terminals **160** to prevent them from contacting one another. Separate wires **1541**, **154***n*, **154***g* extend from the ends of the connector terminals **160** to attach the live, neutral and ground wires **1521**, **152***n*, **152***g* to the live, neutral and ground bus bars **50**, **52**, **62** and terminals **54**, **56**, **64** in each of the first and second housing members **12**, **14**. The insulating ring **170** may include an opening **172** to permit one or more of the wires **1541**, **154***n*, **154***g* to extend therethrough to connect to the internal components **50**, **52**, **62** of the powers strip **10**.

Caps or covers **190**, **192** may be placed on the bottom and top of the circular connectors **110**, **112** to protect the wires and internal components of the power strip. Side members **200** may be attached or extend from the inside walls **210** of the lower and upper members **16**, **18** of the first and second housing members **12**, **14**. Each of the side members **200** includes support members **202** that have a concave or arcuate surface **204** that are aligned with corresponding support members **202** on the other of the upper or lower housing members **16**, **18** to define a recess or groove for receiving the power cord **150** when the first and second housing members **12**, **14** are rotated into the closed position.

An electrical schematic diagram of a power strip of the present invention is shown in FIG. **6** as comprising power cord **150**, sockets **80**, buzzer **100**, breaker switch **300**, line conditioner **310**, and buzzer controller **320**. Power cord **150** includes a 3-prong male plug for coupling to a power source such as, in the United States, a 110-volt alternating current source. Each prong of the male plug is operably coupled to an associated wire or conductor, namely neutral conductor **152***n*, live conductor **1521**, and ground conductor **152***g*. Breaker switch **300**, coupled to live conductor **1521**, may be an illuminated, single pole, single throw ("SPST") type switch, enabling the user to manually switch power to sockets **80** on and off. Moreover, breaker switch **300** may include a solid-state circuit breaker and an associated over-

voltage or other abnormal condition sensor, automatically switching breaker switch **300** from the on (closed, or conducting) to the off (open, or non-conducting) state whenever an over-voltage or other predetermined abnormal condition is detected.

Output **301** of breaker switch **300** is coupled to the live terminals of each socket **80**, and to the live inputs of line conditioner **310** and buzzer controller **320**. Neutral conductor **152***n* is coupled to the neutral terminals of each socket **80**, and to the neutral inputs of line conditioner **310** and buzzer controller **320**. Ground conductor **152***g* is coupled to the ground terminals of each socket **80**.

Line conditioner **110** may include conventional surge suppression and/or Electromagnetic interference/radio frequency interference ("EMI/RFI") filtering circuitry, to protect electrical appliances, equipment or devices plugged into any of sockets **80** from anomalies in the source power received by power cord **150**. Buzzer controller **320** may include sensors to detect one or more alarm conditions. Upon the detection of such a condition, buzzer controller activates buzzer **100**, which may be, for example, a piezoelectric speaker, via conductors **321** and **322**. In one embodiment of the invention, buzzer controller **320** may include a sensor disposed within or proximate the male plug of power cord **150**, sensing an improperly grounded power connection. In another embodiment of the invention, buzzer controller **320** may include a sensor disposed within or proximate the male plug of power cord **150**, sensing excess heat proximate the male plug of the power cord in excess of a predetermined alarm threshold, such as, for example, approximately 125° Fahrenheit. Regardless of the type of abnormal condition sensed, the sensing of an abnormal condition by buzzer controller **320** will cause activation of buzzer **100** via conductors **321** and **322**. Buzzer controller may cause buzzer **100** to emit a continuous sound upon the detection of an alarm condition. Alternatively, buzzer controller may cause buzzer **100** to be activated in a pulsed manner, or in a manner that rises, falls, or alternates in frequency. Furthermore, buzzer **100** may instead be a higher fidelity speaker, and buzzer controller may include a voice synthesizer or stored speech, enabling one or more spoken warnings to be emitted upon the detection of an alarm condition.

In operation, the housing members **12**, **14** and power cord assembly **140** may be rotated independent of one another about the vertical axis **120** to allow them to be positioned in a variety of positions relative to one another to allow the power strip **10** to be adjusted for more efficient use in a variety of locations. When the power strip **10** is in the fully closed or folded position, the power cord **150** will extend along the length of the inside walls **210** of the power strip housing members **12**, **14** and be retained therein through support members **202** to protect the power cord housing **142** during use.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the present invention. It will be appreciated that the present disclosure is intended as an exemplification of the invention and is not intended to limit the invention to the specific embodiment illustrated and described. The disclosure is intended to cover, by the appended claims, all such modifications as fall within the scope of the claims.

The invention claimed is:

1. A foldable power strip comprising:

a first power strip housing member having at least one outlet and a pivotable connector for rotating about a vertical axis;

a second power strip housing member having at least one outlet and a pivotable connector for rotating about the vertical axis, the power strip housing members rotated between a fully open and a closed position;

a power cord; and

a power cord connector for rotationally connecting the power cord about the vertical axis relative to the first and second power strip housing members, the power cord extending in between the power strip housing members in the closed position;

wherein the first power strip housing member, the second power strip housing member and the power cord connector are all independently rotatable relative to one another about the vertical axis.

2. The foldable power strip of claim **1** wherein the power cord connector comprises an annular ring and a tubular member extending therefrom.

3. The foldable power strip of claim **1** wherein the first and second housing members are rotated through a series of set positions.

4. The foldable power strip of claim **3** wherein the set positions are 12.5 degrees apart.

5. The foldable power strip of claim **1** wherein each of the first and second housing members comprises at least two outlets.

6. The foldable power strip of claim **1** wherein the power cord comprises a live wire, a neutral wire and a ground wire and wherein the foldable power strip further comprises three terminal connectors having an input for receiving the live, neutral and ground wires and a first output for connecting to the at least one outlet of the first power strip housing member and a second output for connecting to the at least one outlet of the second power strip housing member.

7. The foldable power strip of claim **6** wherein the terminal connectors are vertically stacked relative to one another and which further comprises an insulator positioned between adjacent terminal connectors.

8. A foldable power strip comprising:

a first power strip housing member having at least one outlet and a pivotable connector for rotating about a vertical axis;

a second power strip housing member having at least one outlet and a pivotable connector for rotating about the vertical axis;

a power cord; and

a power cord connector for rotationally connecting the power cord about the vertical axis relative to the first and second power strip housing members;

wherein the first and second power strip housing members further comprise inside walls and side members extending from the inside walls to define a passageway for retaining the power cord between the housing members when the housing members are in the closed position;

wherein the first power strip housing member, the second power strip housing member and the power cord connector are all independently rotatable relative to one another about the vertical axis; and

wherein the first and second housing members are rotated between a fully open and a closed position.

9. A foldable power strip comprising:

a first power strip housing member having at least one outlet and a pivotable connector for rotating about a vertical axis;

a second power strip housing member having at least one outlet and a pivotable connector for rotating about the vertical axis, the first and second power strip housing members rotated between an open and a closed position

and wherein the first and second power strip housing members further comprise inside walls with side members extending from the insides walls to define a passageway;

a power cord; and

a power cord connector for rotationally connecting the power cord about the vertical axis relative to the first and second power strip housing members, the power cord connector comprising an annular ring and a tubular member extending therefrom;

wherein the first power strip housing member, the second power strip housing member and the power cord connector are all independently rotatable relative to one another about the vertical axis; and

wherein the power cord may be retained within the passageway when the first and second housing members are rotated into the closed position.

10. The foldable power strip of claim **9** wherein the first and second housing members are rotated through a series of set positions.

11. The foldable power strip of claim **10** wherein the set positions are 12.5 degrees apart.

12. The foldable power strip of claim **9** wherein each of the first and second housing members comprises at least two outlets.

13. The foldable power strip of claim **9** wherein the power cord comprises a live wire, a neutral wire and a ground wire and wherein the foldable power strip further comprises three terminal connectors having an input for receiving the live, neutral and ground wires and a first output for connecting to the at least one outlet of the first power strip housing member and a second output for connecting to the at least one outlet of the second power strip housing member.

14. The foldable power strip of claim **13** wherein the terminal connectors are vertically stacked relative to one another and which further comprises an insulator positioned between adjacent terminal connectors.

* * * * *